DRAFT
TECHNICAL MEMORANDUM NO. 3

ADDENDUM TO FINAL PHASE I RFI/RI WORK PLAN

Surface Soil Sampling Plan - Original Landfill

Rocky Flats Plant
Woman Creek Priority Drainage

(Operable Unit No. 5)

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1.0 INTRODUCTION

1.1 BACKGROUND

As part of the Rocky Flats Environmental Restoration program, a multiple staged Resource Conservation and Recovery Act (RCRA) Facility Investigation/Remedial Investigation (RFI/RI) is being conducted for Operable Unit 5 (OU5). Located within OU5 is Individual Hazardous Substance Site (IHSS) 115, the Original Landfill for the Rocky Flats Plant. IHSS 115 was in service from 1952 to 1968 and was used to dispose of general plant wastes which may have included 1,1,1-trichloroethane, dichloromethane, benzene, paint and paint thinners, oil, pesticides, beryllium, uranium, lead and chromium (DOE, 1992).

IHSS 115 is being evaluated in a 5 stage effort as part of the RFI/RI. The 5 stages are summarized as follows, Stage 1 - review of existing data, Stage 2 - field screening surveys, Stage 3 - multimedia surface sampling, Stage 4 - multimedia subsurface sampling, and Stage 5 - additional sampling as needed based on the unique characteristics of the IHSS.

During Stage 1, aerial photographs, the operational history of the landfill and field investigations by the Colorado Department of Health (CDH) and the Environmental Protection Agency (EPA) were used to plot the boundary of the landfill (Figure 1). Approximately 446,000 square feet are encompassed by the landfill over elevations ranging from approximately 5,940 feet to 6,050 feet above mean sea level.

1.2 PURPOSE AND SCOPE

A surface soil sampling program is proposed as part of the Stage 3 RFI/RI field activities for IHSS 115. The purpose of the surface soil sampling program is to characterize the landfill cover and to investigate contaminant anomalies identified in the Stage 1 data review and Stage 2 field screening surveys (DOE, 1992). The primary purpose of this Draft Technical Memorandum is to specify the Stage 3 random surface soil sample locations and the location of surface soil samples to be collected at areas exhibiting radioactivity above natural background (hot spots). Additional surface soil sampling locations may be proposed at a later time based upon review of Stage 2 investigative activities which will include a geophysical survey and a real time soil gas survey.

2.0 PRELIMINARY FIELD ACTIVITIES

Stage 1 preliminary data gathering activities have been completed. The Aerial Photographic Analysis Comparison Report, US DOE Rocky Flats, Golden Colorado, Appendix A, EPA Region 8 (EPA, 1988) has been reviewed and a series of oblique aerial photographs intermittently spanning the period of February 6, 1966 to June 26, 1991 were also reviewed. The results of a 1990 gamma radiation survey as published in Volume II of the OU5 Phase I RFI/RI Work Plan have been reviewed.

2.1 AERIAL PHOTO REVIEW

Dimensions and boundaries of the original landfill have been determined from aerial photos and have been transferred to a scale map of the site (Figure 1). The conclusions drawn from the aerial photo review are summarized below.

1. A suspect area shown as a possible pit off the west end of IHSS 115 has been

enlarged to include an area of disturbed ground that essentially merges with IHSS 115.

2. The drainage ditch that is shown to the east of the outfall pipes was incorporated into the landfill by 1983.

3. An area interpreted as rubble to the east of the road on the east side of IHSS 115 has been enlarged based on an evaluation of the aerial photographs, in particular oblique photographs taken in December, 1987 that clearly define the rubble piles. This has now been interpreted to be material used to construct a collection basin for the discharge outlet for the outfall pipe shown on Figure 1.

4. The initial buried outfall pipe was constructed in 1986 and was extended to the south by a corrugated metal flume. The outfall pipe extending to the southeast was added in either 1987 or 1988. The construction of both pipes would have resulted in the displacement and re-burial of a substantial amount of landfill material.

5. The drainage ditch shown to the east of the outfall pipes was visible on vertical aerial photographs from 1955 through 1981, and was apparently covered or partially filled by 1983. The ditch is clearly visible on oblique photographs taken in 1967 and 1969, and shows a culvert under the railroad tracks and probably under the main road. There is no photographic evidence that the culvert was removed, sealed, or extended before the ditch was incorporated into the landfill.

6. The berm shown to the south of the west end of the landfill is shown under construction in oblique photographs taken on November 15, 1967. Oblique photographs taken on June 5, 1969, July 11, 1969, and May 15, 1970 show the area behind the berm (north side) in various stages of being filled with rubble and

a number of large unidentifiable objects. It may be significant to note that one of the U238 anomalies detected by the HPGe survey occurred just to the south of this berm.

7. Oblique photographs show that the pond identified on the 1955 vertical aerial photograph and interpreted to be filled in on subsequent photographs, is now interpreted to have been completely washed out in later years. Consequently, any sludge or sediments that would have accumulated when the pond was in use (indicated filter backwash site) may have spread out below the pond site or been deposited in Woman Creek prior to the construction of the South Intercepter Ditch (SID).

The grid area for locating random surface soil samples described in section 3.1 of this document is based upon the aerial photo review, field surveys by CDH and EPA which extended the southern boundary of the landfill, and the results of 1990 gamma radiation survey.

2.2 RADIATION SURVEY

During the period of October 25, 1990 to December 8, 1990 a gamma radiation survey was conducted over the original landfill using a 20 percent N-type, high germanium detector (DOE, 1992). The survey data is presented in Volume II of the Phase I RFI/RI Work Plan. Review of the data contained in the Work Plan indicates that activity from most of the detected isotopes were consistent with natural background; however, there were areas that exhibited elevated uranium ^{238} activity (hot spots). These hot spots are shown on Figure 2. The conclusions drawn from the gamma radiation survey are summarized below.

1. Volume II, Appendix B of the OU5 Work Plan shows contours for a large anomaly located over the central portion of the landfill. This anomaly encompasses survey stations C-8, C-9, B-7 and B-8 shown on Figure 2. This

anomaly is most likely a composite of point sources.

2. Anomalies D.3 and P.2 detected to the south and east of the landfill respectively appear to be related to landfill material that was excavated during the construction of the SID.

3. The location and source for the anomaly at SP.2 is documented by photographs 19, 20 and 21 in a volume entitled Photographs of Woman Creek, OU5. The description for one of the photographs includes the coordinates (with a typographical error) of the source, which exactly coincide with the coordinates of SP.2.

4. All of the indicated U238 occurrences along the "W" line (survey points W-1, W-2, W-3, W-8 and W-11) which extends along the north bank of Woman Creek appear to be related to natural drainage features which drain into the creek. It can be inferred that the contaminants along the creek are the result of long term accumulation.

The locations of the B.7, B.8, C.8, C.9, D.3, P.2, and SP.2 hot spots have been land surveyed and marked with stakes. Sample locations for the "W" line hot spots will be identified in the field by means of a compass, measuring tape and surveyed markers installed as part of the geophysical and SOV surveys. State plane coordinates for each of the hot spots are listed in Table 1 and surface soil samples will be collected at these locations.

2.3 GEOPHYSICAL SURVEYS

Magnetometer and electro-magnetic (EM) surveys will be conducted on the original landfill and downgradient of the original landfill. The surveys will also cover the disturbed area to the east of the original landfill. The surveys may provide additional information regarding the areal

TABLE 1

RADIATION HOT SPOTS AND DISTURBED AREA SURFACE SOIL SAMPLE LOCATION NUMBERS STATE PLANE COORDINATES AND SAMPLE NUMBERS - IHSS 115

Sample No.	Surface Soil Sample Location No.	Hot Spot Survey No.	State Plane Coordinates	
SS50001ASU5	SS505092	SP-2	E2081190	N747882
SS50002ASU5	SS505192	D-3	E2081194	N747564
SS50003ASU5	SS505292	B-7	E2081794	N747865
SS50004ASU5	SS505392	C-8	E2081944	N747715
SS50005ASU5	SS505492	B-8	E2081994	N747864
SS50006ASU5	SS505592	C-9	E2082094	N747714
SS50007ASU5	SS505692	P-2	E2082336	N747656
SS50008ASU5	SS505792	W-1	E2080789	N747126
SS50009ASU5	SS505892	W-2	E2080905	N747262
SS50010ASU5*	SS505992	W-3	E2081136	N747341
SS50011ASU5	SS506092	W-8	E2081944	N747408
SS50012ASU5	SS506192	W-11	E2082425	N747471

* Indicates that a duplicate sample will be collected at this location.

The last 2 digits of the sample location number (92) may change to 93 based upon the year the sample is collected.

extent of the original landfill. The Final Technical Memorandum will address the findings of the geophysical survey and whether or not additional surficial soil samples are needed.

2.4 SOIL ORGANIC VAPOR SURVEY

A real-time soil organic vapor (SOV) survey will be conducted over the original landfill and the disturbed area to the east of the landfill. The SOV survey will be used to identify plumes of volatile contaminants that may be present beneath and downgradient of the original landfill. The results of the SOV will be used to select locations for soil borings that will be conducted during Stage 3 investigation activities.

3.0 SURFACE SOIL SAMPLING PROGRAM

3.1 SOIL SAMPLE LOCATIONS - LANDFILL

Radiation anomalies and the areal extent of the original landfill have been defined based upon the Stage 1 data review activities described above. Surface soil sampling activities will focus on the radiation hot spots, random sampling of the disturbed area to the east of the landfill and random sampling over the full extent of landfill.

Twelve hot spots were identified during the review of the 1990 gamma radiation survey. With the exception of hot spot SP-2, one surface soil sample will be collected near the center of each of the 1990 gamma radiation survey hot spots (Figure 2) using the Rocky Flats surface soil sampling methods described in EG&G Operating Procedure GT.8. Two surface soil samples will be collected downgradient of the source for SP-2 to determine if runoff has transported contamination from the source. The sample locations for SP-2 will be determined in the field at the time of sampling based upon health and safety considerations. These samples will be analyzed only for those radionuclides shown in Table 2.

TABLE 2

IHSS 115
ANALYTICAL PARAMETERS

TARGET ANALYTE LIST - METALS	DETECTION LIMITS Soil (mg/kg)
Aluminum	40
Antimony	12
Arsenic	2
Barium	40
Beryllium	1.0
Cadmium	1.0
Calcium	2000
Cesium	200
Chromium	2.0
Cobalt	10
Copper	5.0
Cyanide	10
Iron	20
Lead	1.0
Lithium	20
Magnesium	2000
Manganese	3.0
Mercury	0.2
Molybdenum	40
Nickel	8.0
Potassium	2000
Selenium	1.0
Silver	2.0
Sodium	2000
Strontium	40
Thallium	2.0
Tin	40
Vanadium	10.0
Zinc	4.0
TOTAL ORGANIC CARBON	1

TABLE 2 - Continued
IHSS 115
ANALYTICAL PARAMETERS

TARGET COMPOUNDS LIST - VOLATILES(contiunued)	QUANTITATION LIMITS* Soil (ug/kg)
Chloromethane	10
Bromomethane	10
Vinyl Chloride	10
Chloroethane	10
Methylene Chloride	5
Acetone	10
Carbon Disulfide	5
1,1-Dichloroethene	5
1,1-Dichloroethane	5
total 1,2-Dichloroethene	5
Chloroform	5
1,2-Dichloroethane	5
2-Butanone	10
1,1,1-Trichloroethane	5
Carbon Tetrachloride	5
Vinyl Acetate	10
Bromodichloromethane	5
1,1,2,2-Tetrachloroethane	5
1,2-Dichloropropane	5
trans-1,3-Dichloropropene	5
Trichloroethene	5
Dibromochloromethane	5
1,1,2-Trichloroethane	5
Benzene	5
cis-1,3-Dichloropropene	5
Bromoform	5
2-Hexanone	5
4-Methyl-2-pentanone	10
Tetrachloroethene	10
Toluene	5
Chlorobenzene	5
Ethyl Benzene	5
Styrene	5
Total Xylenes	5

TABLE 2 - Continued
IHSS 115
ANALYTICAL PARAMETERS

TARGET COMPOUNDS LIST - SEMIVOLATILES (continued)	QUANTITATION LIMITS* Soil (ug/kg)
Phenol	330
bis(2-Chloroethyl) ether	330
2-Chlorophenol	330
1,3-Dichlorobenzene	330
1,4-Dichlorobenzene	330
Benzyl Alcohol	330
1,2-Dichlorobenzene	330
2-Methylphenol	330
bis(2-Chloroisopropyl) ether	330
4-Methylphenol	330
N-Nitroso-di-n-dipropylamine	330
Hexachloroethane	330
Nitrobenzene	330
Isophorone	330
2-Nitrophenol	330
2,4-Dimethylphenol	330
Benzoic Acid	1600
bis(2-Chloroethoxy) methane	330
2,4-Dichlorophenol	330
1,2,4-Trichlorobenzene	330
Naphthalene	330
4-Chloroaniline	330
Hexachlorobutadiene	330
4-Chloro-3-methylphenol (para-chloro-meta-cresol)	330
2-Methylnaphthalene	330
Hexachlorocyclopentadiene	330
2,4,6-Trichlorophenol	330
2,4,5-Trichlorophenol	1600
2-Chloronaphthalene	330
2-Nitroaniline	1600
Dimethylphthalate	330
Acenaphthylene	330
2,6-Dinitrotoluene	330

TABLE 2 - Continued
IHSS 115
ANALYTICAL PARAMETERS

TARGET COMPOUND LIST - SEMIVOLATILES (continued)	QUANTITATION LIMITS* Soil (ug/kg)
3-Nitroaniline	1600
Acenaphthene	330
2,4-Dinitrophenol	1600
4-Nitrophenol	1600
Dibenzofuran	330
2,4-Dinitrotoluene	330
Diethylphthalate	330
4-Chlorophenyl Phenyl ether	330
Fluorene	330
4-Nitroaniline	1600
4,6-Dinitro-2-methylphenol	1600
N-nitrosodiphenylamine	330
4-Bromophenyl Phenylether	330
Hexachlorobenzene	330
Pentachlorophenol	1600
Phenanthrene	330
Anthracene	330
Di-n-butylphthalate	330
Fluoranthene	330
Pyrene	330
Butylbenzylphthalate	330
3,3'-Dichlorobenzidine	660
Benzo(a)anthracene	330
Chrysene	330
bis(2-Ethylhexyl)phthalate	330
Di-n-octylphthalate	330
Benzo(b)fluoranthene	330

TABLE 2 - Continued
IHSS 115
ANALYTICAL PARAMETERS

TARGET COMPOUND LIST - SEMIVOLATILES (continued)	QUANTITATION LIMITS* Soil (ug/kg)
Benzo(k)fluoranthene	330
Benzo(a)pyrene	330
Indeno(1,2,3-cd)pyrene	330
Dibenz(a,h)anthracene	330
Benzo(g,h,i)perylene	330
alpha-BHC	8.0
beta-BHC	8.0
delta-BHC	8.0
gamma-BHC (Lindane)	8.0
Heptachlor	8.0
Aldrin	8.0

TARGET COMPOUND LIST - PESTICIDES/PCBS (continued)	QUANTITATION LIMITS* Soil (ug/kg)
Heptachlor epoxide	8.0
Endosulfan I	8.0
Dieldrin	16.0
4,4'-DDD	16.0
Endrin	16.0
Endosulfan II	16.0
4,4'-DDD	16.0
Endosulfan sulfate	16.0
4,4'-DDT	16.0
Methoxychlor	80.0
Endrin ketone	16.0
alpha-Chlordane	80.0

TABLE 2 - Continued
IHSS 115
ANALYTICAL PARAMETERS

TARGET COMPOUND LIST - PESTICIDES/PCBS (continued)	QUANTITATION LIMITS* Soil (ug/kg)
gamma-Chlordane	80.0
Toxaphene	160.0
Aroclor-1016	80.0
Aroclor-1221	80.0
Aroclor-1232	80.0
Aroclor-1242	80.0
Aroclor-1248	80.0
Aroclor-1254	160.0
Aroclor-1260	160.0

RADIONUCLIDES	REQUIRED DETECTION LIMITS* Soil (pCi/g)
Gross Alpha	4 dry
Gross Beta	10 dry
Uranium 233+234, 235, and 238 (each species)	0.3 dry
Americium 241	0.02 dry
Plutonium 239+240	0.03 dry
Tritium	400 (pCi/ml)
Cesium 137	0.1 dry
Strontium 89+90	1 dry

* Detection and quantitation limits are highly matrix dependent. The limits listed here are the minimum achievable under ideal conditions. Actual limits may be higher.

In accordance with section 7.2.1 of the OU5 Work Plan at least three surface soil samples will be collected from the disturbed area to the east of the original landfill. The sample locations were selected by overlaying a grid of 52 sequentially numbered cells with a map scale dimensions of 50 feet by 50 feet on a map of the study area. The RANDOMIZE and RND functions of Quick Basic were used to generate three random numbers in the range of 1 to 52 as follows:

```
10 RANDOMIZE (random number seed 212)
20 FOR J= 1 TO 3
30 L=INT(52*RND(1))+1
40 PRINT L
50 NEXT J
```

Three grid cells corresponding to the numbers generated by Quick Basic were selected as the proposed sample locations (Figure 3). These samples will be collected according to the Rocky Flats soil sampling method and analyzed for both the radionuclides and conventional analytes shown in Table 2.

In addition to the samples described above, seventy random surface soil samples will be collected to characterize the landfill cover material and any exposed fill material using the Rocky Flats soil sampling method. The proposed random sample locations are shown on Figure 3 and are based upon simple random sample methods described in SW-846 (EPA, 1986), Gilbert, 1987 and geostatistical methods (Rockwell, 1988).

When using random sampling methods the probability of locating a contaminated zone is related to the area of the contaminated zone and the spatial distribution of the sample locations. To determine the number of samples that are needed to achieve a 90 percent probability of locating a contaminated zone, a random number generator, as described above, was used to locate one theoretical contaminant zone (100 feet by 100 feet) within the landfill boundaries, then using a grid with dimensions of (50 feet by 50 feet), random sample locations were generated in an iterative manner. Two runs of ten iterations each were conducted, and each iteration was scored

according to the number of sample locations that fell within the theoretical contaminant zone. The number of samples was increased by three for each run of ten iterations until the probability of a hit (number of samples within the contaminated zone divided by the number of iterations) equaled 90 percent.

A theoretical contaminant zone or target of 100 feet by 100 feet was selected based upon the assumptions that any windborne dispersion of contaminants is uniform over the landfill cover, and contaminants exposed by erosion of cover material are located within landfill cells with areal dimensions of 50 feet by 100 feet. The theoretical contaminant zone represents an area equivalent to the assumed dimensions of two landfill cells. Grid dimensions of 55.5 feet by 55.5 feet were determined using statistical procedures for calculating grid size as described in Gilbert, 1987. The grid dimensions were reduced to 50 feet by 50 feet for convenience in scaling and plotting applications.

The state plane coordinates of each proposed random sample location are listed in Table 3. Sample locations will be identified in the field by means of a compass, measuring tape, and surveyed markers installed as part of the geophysical and SOV surveys. The location of each random sample will be staked at the time the sample is collected and land surveyed at a later date.

One duplicate sample will be collected and one rinsate sample will be collected for every 10 samples collected in accordance with quality control procedures specified in the Quality Assurance Addendum to the OU5 Work Plan (DOE, 1992).

3.2 FIELD PROCEDURES

Field procedures for collecting surface soil samples are specified in EG&G Operating Procedure GT.8 (EG&G, 1992a). Samples collected for both radiological and conventional analysis will be collected according to the Rocky Flats method, Section 5.0 of GT.8 (EG&G, 1992a).

TABLE 3

RANDOM SURFACE SOIL SAMPLE LOCATION NUMBERS STATE PLANE COORDINATES AND SAMPLE NUMBERS - IHSS 115

Sample No.	Surface Soil Sample Location No.	State Plane Coordinates	
SS50013ASU5	SS506292	E2080915	N747800
SS50014ASU5	SS506392	E2080985	N747756
SS50015ASU5	SS506492	E2081067	N747712
SS50016ASU5	SS506592	E2081065	N747850
SS50017ASU5	SS506692	E2081115	N747700
SS50017ASU5	SS506792	E2081115	N747750
SS50018ASU5	SS506892	E2081186	N747647
SS50019ASU5	SS506992	E2081165	N747700
SS50020ASU5	SS507092	E2081165	N747750
SS50021ASU5	SS507192	E2081215	N748750
SS50022ASU5	SS507292	E2081215	N747950
SS50023ASU5	SS507392	E2081244	N747674
SS50024ASU5	SS507492	E2081265	N747700
SS50025ASU5	SS507592	E2081280	N747987
SS50026ASU5	SS507692	E2081315	N747750
SS50027ASU5	SS507792	E2081315	N747850
SS50028ASU5	SS507892	E2081315	N747950
SS50029ASU5	SS507992	E2081354	N747713

TABLE 3
SURFACE SOIL SAMPLE LOCATION NUMBERS
STATE PLANE COORDINATES
AND SAMPLE NUMBERS - ORIGINAL LANDFILL

Sample No.	Surface Soil Sample Location No.	State Plane Coordinates	
SS50030ASU5	SS508092	E2081365	N747800
SS50031ASU5	SS508192	E2081365	N747950
SS50032ASU5	SS508292	E2081465	N747850
SS50033ASU5	SS508392	E2081465	N747900
SS50034ASU5	SS508492	E2081465	N747050
SS50035ASU5	SS508592	E2081515	N747550
SS50036ASU5	SS508692	E2081515	N747800
SS50037ASU5	SS508792	2081515	N747900
SS50038ASU5	SS508892	E2081556	N747523
SS50039ASU5	SS508992	E2081565	N747850
SS50040ASU5	SS509092	E2081565	N747900
SS50041ASU5	SS509192	E2081615	N747650
SS50042ASU5	SS509292	E2081615	N748000
SS50043ASU5	SS509392	E2081665	N747900
SS50044ASU5	SS509492	E2081665	N747950
SS50045ASU5	NA	NA	NA
SS50046ASU5	SS509592	E2081715	N747600
SS50047ASU5	SS509692	E2081715	N747700

TABLE 3
SURFACE SOIL SAMPLE LOCATION NUMBERS STATE PLANE COORDINATES AND SAMPLE NUMBERS - ORIGINAL LANDFILL

Sample No.	Surface Soil Sample Location No.	State Plane Coordinates	
SS50048ASU5	SS509792	E2081715	N747750
SS50049ASU5	SS509892	E2081715	N747850
SS50050ASU5	SS509992	E2081715	N748000
SS50051ASU5	SS510092	E2081765	N747600
SS50052ASU5	SS510192	E2081765	N747700
SS50053ASU5	SS510292	E2081765	N747750
SS50054ASU5	SS510392	E2081765	N747800
SS50055ASU5	SS510492	E2081765	N747850
SS50056ASU5	SS510592	E2081765	N748000
SS50057ASU5	SS510692	E2081815	N747550
SS50058ASU5	SS510792	E2081815	N747850
SS50059ASU5	SS510892	E2081815	N747900
SS50060ASU5	SS510992	E2081815	N747950
SS50061ASU5	SS511092	E2081865	N747550
SS50062ASU5	SS511192	E2081865	N747600
SS50063ASU5	SS511292	E2081857	N748084
SS50064ASU5	SS511392	E2081915	N747500
SS50065ASU5	SS511492	E2081915	N747550

TABLE 3
SURFACE SOIL SAMPLE LOCATION NUMBERS
STATE PLANE COORDINATES
AND SAMPLE NUMBERS - ORIGINAL LANDFILL

Sample No.	Surface Soil Sample Location No.	State Plane Coordinates	
SS50066ASU5	SS511592	E2081915	N747600
SS50067ASU5	SS5011692	E2081915	N747650
SS50068ASU5	SS5011792	E2081915	N747750
SS50069ASU5	SS5011892	E2081915	N747800
SS50070ASU5	SS5011992	E2081915	N747900
SS50071ASU5	SS5012092	E2081965	N747550
SS50072ASU5	SS5012192	E2081965	N747600
SS50073ASU5	SS5012292	E2081965	N747650
SS50074ASU5	SS5012392	E2081965	N747850
SS50075ASU5	SS5012492	E2081965	N747900
SS50076ASU5	SS5012592	E2081965	N748950
SS50077ASU5	SS5012692	E2081958	N748039
SS50078ASU5	SS5012792	E2082015	N747550
SS50079ASU5	SS5012892	E2082015	N747850
SS50080ASU5	SS5012992	E2082065	N747750
SS50081ASU5	SS5013092	E2082065	N747900
SS50082ASU5	SS5013192	E2082115	N748000
SS50083ASU5	SS5013292	E2082215	N748000

TABLE 3
SURFACE SOIL SAMPLE LOCATION NUMBERS
STATE PLANE COORDINATES
AND SAMPLE NUMBERS - ORIGINAL LANDFILL

Sample No.	Surface Soil Sample Location No.	State Plane Coordinates	
SS50084ASU5	SS5013392	E2082257	N748000
SS50085ASU5	SS5013492	E2082315	N747850
SS50086ASU5	SS5013592	E2082366	N748096
SS50087ASU5	SS5013692	E2082565	N748050

The last 2 digits of the sample location number (92) may change to 93 based upon the year the sample is collected.

Equipment needed for surface soil sampling is specified in GT.8 (EG&G, 1992a). Decontamination will be in accordance with EG&G Operating Procedure FO.3 (EG&G, 1992b). Sample labeling, shipment, and preservation will be conducted according to EG&G Operating Procedures FO.13 (EG&G, 1992c). Sample designations, documentation, data package preparation, and sample tracking will be in accordance with EG&G Operating Procedure FO.14 (EG&G, 1992d). Data Reduction, Validation and Reporting will be in accordance with section 3.9 of the Quality Assurance Addendum to the OU5 Work Plan (DOE, 1992) and section 3.4 of the Quality Assurance Project Plan (EG&G, 1991).

A summary of surface soil sampling field methods is provided below, details of the methods are given in the EG&G Operating Procedures.

1.0 The radiation survey results must satisfy the pre-work area radiation monitoring requirements and forms FO.16A and FO.16B must be completed - SOP FO.16.

2.0 Decontamination equipment must be assembled for field use as required by FO.3: liquinox, bristle brushes (all plastic), rocky flats tap water or distilled water, non-reactive plastic wrap, plastic wash and rinse tubs, plastic sheeting for use as a ground cloth, and paper towels.

3.0 The following sampling equipment must be obtained as required by FO.13: sample glassware with preservative (see Table 4), coolers, thermometer, blue ice, sample labels, chain of custody forms, custody seals, baggies, bubble wrap, vermiculite, strapping tape, clear tape, a carboy for transport of rinsate, and forms included in Appendix I of this document.

Surface soil samples will be collected according to the Rocky Flats method. The following sample collection equipment must be obtained as required by GT.8: soil sampling jig (10 x 10 x 5 cm), spare sampling jig parts, stainless steel scoop, brushes,

wire, new 1 gallon metal paint cans, hammer, miscellaneous cold chisels, pointed cement trowel, black waterproof marking pens, metric rule, wood block (10 x 10 x 30 cm), site selection plan, health and safety equipment including PID and radiation survey instrument, and logbook.

4.0 Sampling equipment will be decontaminated in accordance with FO.3 and documented on form FO.3A. Disposal of decontamination water shall be in accordance with FO.7, section 6.1.1. Steam cleaning of sample coolers and previously used disposal drums is required.

5.0 Sampling sites will be located using a steel tape, compass and survey monuments; coordinates for the sample locations are given in Table 3 of this document. Surface soil samples for radiological and conventional analyses will be collected in accordance with the Rocky Flats method, GT.8, section 5.2.3. Briefly, this method consists of compositing ten soil samples collected from the center and each corner of two one-meter squares that are spaced one-meter apart at each sampling location.

All sampling activities will be documented in a field logbook and on forms GT.8A and GT.8B. Documentation will include the following items listed in EG&G Operating Procedure FO.13 section 6.4: sampling activity name and number, sampling point name and number, sample number, name(s) of collector(s) and others present, date and time of sample collection, sample container tag/label number (if appropriate), preservative(s), requested analyses, sample matrix, filtered or unfiltered, designation of QC samples, collection methods, chain of custody control numbers, field observations and measurements during sampling, and signature.

Samples will be processed for shipment in accordance with FO.13 and the chain of custody (COC) form will be completed and a COC number assigned to it.

6.0 Field equipment will be decontaminated in between sample locations in accordance with

FO.3, disposal of the leftover rinsate will be in accordance with FO.7, Section 6.1.1.

9.0 The data tracking process will be in accordance with FO.14 using form FO.14A. The data entry process will be as prescribed on forms FO.14C, FO.14H and FO.14K.

3.3 ANALYTICAL PARAMETERS

Each randomly located soil sample will be analyzed for target analyte list (TAL) metals, total organic carbon (TOC), target compound list (TCL) semi-volatiles, TCL pesticides, and a suite of radioanalytes specified in Table 2. Soil samples collected from hot spots identified during the review of the 1990 gamma radiation survey will be analyzed for the suite of radioanalytes specified in Table 2. All analytical work will be conducted by an EG&G contract laboratory. Holding times, preservatives, and sample containers for each of the analytes are shown in Table 4.

TABLE 4

ANALYTES, SAMPLE CONTAINERS, PRESERVATIVES AND HOLDING TIMES

Analyte	Container	Preservative	Holding Time
TAL Metals	Soil - 8oz. wide mouth glass jar.	None	6 months
	Rinsate - 1 liter plastic bottle.	Nitric acid pH < 2	6 months
TOC	Soil - 8oz. wide mouth glass jar.	Cool 4° C	28 days
TCL Semi-volatiles	Soil - 8oz. wide mouth glass jar.	Cool, 4 deg. C	7 days until extraction, 40 days post extraction.
	Rinsate - 4 liter amber glass bottle.	Cool, 4 deg. C	7 days until extraction, 40 days post extraction.
TCL Pesticides	Soil - 8oz. wide mouth glass jar.	Cool, 4 deg. C	7 days until extraction, 40 days post extraction.
	Rinsate - 4 liter amber glass bottle.	Cool, 4 deg. C	7 days until extraction, 40 days post extraction.

TABLE 4

ANALYTES, SAMPLE CONTAINERS, PRESERVATIVES AND HOLDING TIMES

Radiological Tests - gross alpha, gross beta, $U^{233/234}$, U^{235}, U^{238}, $Pu^{239/240}$, Am^{241}	Soil - 500 mL wide mouth glass jar. Rinsate - 3 x 4 liter plastic containers.	None HNO_3	None 6 months

4.0 REFERENCES

DOE (Department of Energy), 1992, Final Phase I RFI/RI Work Plan for Rocky Flats Woman Creek Priority Drainage (Operable Unit No. 5), Revision 1, February.

EG&G, 1991 Environmental Restoration Program (ERP) Quality Assurance Project Plan For CERCLA Remedial Investigations/Feasibility Studies and RCRA Facility Investigations/Corrective Measures Studies Activities, May 5, 1991.

EG&G, 1992a Environmental Management Department (EMD) Manual Operation Standard Operating Procedure (SOP) GT.9, Revision 2, Surface Soil Sampling, March 1, 1992.

EG&G, 1992b Environmental Management Department (EMD) Manual Operation Standard Operating Procedure (SOP) FO.3, Revision 2, General Equipment Decontamination, March 1, 1992.

EG&G, 1992c Environmental Management Department (EMD) Manual Operation Standard Operating Procedure (SOP) FO.13, Revision 2, Containerization, Preserving, Handling and Shipping of Soil and Water Samples, March 1, 1992.

EG&G, 1992d Environmental Management Department (EMD) Manual Operation Standard Operating Procedure (SOP) FO.14, Revision 2, Field Data Management, March 1, 1992.

EPA (Environmental Protection Agency), 1986, Test Methods for Evaluating Solid Waste, SW-846, Third Edition, November, 1986.

EPA (Environmental Protection Agency), 1988, Aerial Photographic Analysis Comparison Report, US DOE, Rocky Flats, Golden, Colorado, Appendix A, EPA Region 8, TS-PIC-88760, July 1988.

Gilbert, R.O., 1987, Van Norstrand Reinhold, Statistical Methods for Environmental Pollution Monitoring.

Rockwell (Rockwell Hanford Operations), 1988, Hanford Generic Remedial Investigation/Feasibility Study Work Plan, SD-RE-AR-003, February, 1988.

APPENDIX I

EG&G SAMPLE DOCUMENTATION FORMS

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT FORM FO.16A (REV. 2)

RESULTS OF RADIOLOGICAL MEASUREMENTS IN THE FIELD

Project Name: _____

Date: _____ Site Number: _____

Snow Cover Present (Y/N): _____ Work Surface Wet (Y/N): _____

1. Instruments Used and Background Readings

Manufacturer and Model No.	Serial Number	Probe Type	Probe Serial No.	Calibration Due Date	Background Reading (cpm)

2. Prework Monitoring Results (Ludlum 12)

_____ cpm at Point of Intrusive Activity _____ Highest Measured cpm

3. Sample Monitoring: Intervals Monitored and Associated Samples

Depth Interval (Ft)	Highest Level Noted (cpm)	Associated Sample Numbers

Completed By: _____
Print Name Signature Date

Subcontractor: _____

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT FORM FO.16B (REV. 2)

RESULTS OF RADIOLOGICAL MEASUREMENTS IN THE FIELD

Project Name: _____

Date: _____ Site Number: _____

Snow Cover Present (Y/N): _____

1. Instruments Used and Background Readings

Manufacturer and Model No.	Serial Number	Probe Type	Probe Serial No.	Calibration Due Date	Background Reading (cpm)

2. PPE Monitoring

_____ PPE monitoring not required. Work area was characterized as uncontaminated and field radiological screening as work progressed did not indicate the presence of potential contamination.

If PPE monitoring required complete the following table

Ludlum Model 12	Bicron Analyst Fidler	PPE screening resulted in verived positive reading (Y/N)	Time	PPE Verified positive reading (cmp)	Smear No.

Completed By: _____
Print Name Signature Date

Subcontractor: _____

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT FORM FO.10A (REV. 2)

DRUM FIELD LOG FORM

NAME OF THE SUBCONTRACTOR _____

DRUM ID NUMBER WITH SUB. ID _____

DRUM ISSUE DATE _____

LOCATION OF ISSUANCE _____

PROJECT NAME & NUMBER _____

LOCATION OF FIELD ACTIVITY _____

ASSOCIATED WELL, BORING, OR _____

CONTENTS OF DRUM _____

SUBSURFACE INTERVALS (IF SOILS) _____ _____

_____ _____

_____ _____

ASSOCIATED SAMPLE ID NUMBERS _____ _____

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

DATE DRUM WAS FILLED _____

SIG. OF PERSON FILLING THE DRUM _____

IF SOLID ENVIRONMENTAL MATERIALS

LOCATION OF TEMP. STORAGE AREA _____

DATE DRUM RETURNED TO EG&G _____

SIG. OF EG&G REPRESENTATIVE _____

IF ENVIRONMENTAL LIQUIDS

DATE & LOCATION WHERE CONTENTS	DATE	LOCATION
WERE EMPTIED AND DECONNED		
(e.g. 2/18/91 DECON PAD #___)		

DRUM INSPECTION FORM

DRUM ID NUMBER WITH SUBCONTRACTOR'S ID	STAGING LOCATION	DATE(S)

INSPECTION DATE	DRUM STATUS	INSPECTOR'S SIGNATURE

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT FORM FO.10C (REV. 2)

CONTAMINANT CHARACTERIZATION FORM FOR GRAY DRUMS PENDING CHARACTERIZATION

ATTACH CHEMICAL RESULTS OF ASSOCIATED SAMPLES

THIS PORTION WILL BE COMPLETED BY THE SUBCONTRACTOR

Name of the Subcontractor Issued the Drum .....
The Serialized Drum ID Number with the Subcontractor's ID .....
The Drum Issue Date .....
The Location of the Field Activity Area .....
The Associated Well, Boring, or Sampling Location .....
The Contents of the Drum .....
Subsurface Intervals (Ft), if Soils or Bag Numbers, if PPE ....

The Date the Drum was Filled .....
Matrix of Samples Analyzed .....

ASSOCIATED SAMPLES

Sample No.	Depth (ft)	Sample No.	Depth (ft)	Sample No.	Depth (ft)

Date Submitted to EG&G for Characterization .....
Subcontractor's Representative Signature .....

THIS PORTION WILL BE COMPLETED BY EG&G

The Contaminant Characterization of the Drum's Contents .....
Signature of EG&G Representative Determining the Contaminant Characterization and Date Signed .....
Date
EG&G Holding Facility Where Drum Will be Stored .....

Date and Time Form Returned to Waste Operations ..... Date Time

EQUIPMENT DECONTAMINATION/WASH CHECKLIST AND RECORD

I. General Information completed by: _____

Name Date Phone No.

_____

Subcontractor's Name

NOTE: Sections I and II will be completed by the same individual.

Equipment Manufacturer, Model and Common Name:_____

Equipment Owner:_____

Name and Phone Number of Person Responsible for the Equipment:_____

Serial Number/Equipment Identification Number:_____

Delivered to Decontamination Station by:_____

Initial contaminate characterization of work area: (check one)

Not potentially contaminated _____

Potentially contaminated _____

II. Activity History

Where was equipment used? _____

What was equipment used for? _____

Types and volumes of water generated: (check as appropriate)

_____ Purge _____ Gallons

_____ Development _____ Gallons

_____ Decon/Wash _____ Gallons

_____ Rinse _____ Gallons

EQUIPMENT DECONTAMINATION/WASH CHECKLIST AND RECORD

III. Actions At Central Decontamination Station

Yes	No	
_____	_____	The equipment was washed under the provisions of SOP No. FO.3, General Equipment Decontamination
_____	_____	Personnel Decontamination Station established as described in the applicable site-specific health and safety plan
_____	_____	Personal protective equipment (PPE) selected based upon work area PPE level
_____	_____	Specify PPE level utilized: _____ Level B _____ Level C _____ Level D
_____	_____	PPE inspected prior to donning
_____	_____	Wind direction checked prior to using pressurized spray (circle the direction the wind was blowing from) N NE E SE S SW W NW
_____	_____	Was particular attention devoted to equipment parts that contacted potentially contaminated medium?
_____	_____	Was personal decontamination completed as described in the applicable site-specific health and safety plan?

SURFACE SOIL
DATA COLLECTION FORM

Sample Number _____
Collection Date _____
Collection Time _____
Location Code _____
Chain of Custody No. _____

Coordinates North or Y _____ East or X _____

Sample Location _____

Composite (Y/N) _____
Composite Description _____

Collection Method _____
Sample Team Leader _____
Sample Team Member _____
Sample Team Member _____
Sample Team Member _____
Container Size (Oz) _____ % Full _____

Comments _____

Completed By: _____
Print Name Signature Date

Subcontractor: _____

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANTS FORM GT.8B (REV. 2)

SURFACE SOIL SAMPLING FIELD ACTIVITIES REPORT

Project Name _____

Site Identification _____ Date _____

Sampler _____

SAMPLE POINT	GRID LOCATION	TIME	COMMENTS

Completed By: _____
Print Name Signature Date

Subcontractor: _____

(4011-930-0069-930)(GT8REV.2)(03/02/92)

CONTRACTOR _____ SAMPLERS _____ PROJECT # _____

SITE CONTACT/PHONE _____ LAB/LOCATION _____

C-O-C NUMBER

EG&G ROCKY FLATS, CHAIN OF CUSTODY

DATE/TIME	SAMPLE NUMBER	LOCATION	CONTAINER TYPE	NUMBER OF CONTAINERS	MEDIA: S=SOIL, W=WATER	F=FILTERED, U=UNFILTERED	R=TURN AROUND RUSH	OUT OF SPEC REPORTS	PRESERVATIVE: COOLED TO 4°C	NAOH	HNO_3	H_2SO_4	BOTTLE CODE : ANALYTE	FIELD COMPOSITE (Y/N)

RELINQUISHED BY	DATE/TIME	RECEIVED BY	DATE/TIME

REMARKS

SHIPMENT METHOD :

AIR BILL NO.:

LABORATORY USE ONLY	Y	N
PCKG REC'D/CUSTODY SEALS INTACT		
SAMPLE LABELS/COCs AGREE		
TEMPERATURE WITHIN SPECIFICATION _____C		
CORRECTED COPY ATTACHED		
PROBLEMS OR DISCREPANCIES		

SUB WHITE AND YELLOW COPIES WITH SAMPLES -- RETAIN PINK FIELD COPY

U.S. DEPARTMENT OF ENERGY ROCKY FLATS PLANT FORM FO.14A

ROCKY FLATS ENVIRONMENTAL DATABASE SYSTEM (RFEDS)
FIELD DATA TRANSMITTAL FORM

DATA FOR THE WEEK OF _____ SUBCONTRACTOR _____

TYPE OF DATA

GROUNDWATER SAMPLING	☐	WELL INSTALLATION/GEOLOGIC LOGGING	☐
SURFACE SOIL SAMPLING	☐	BIOLOGICAL SAMPLING	☐
SEDIMENT SAMPLING	☐	SAMPLE TRACKING	☐
BOREHOLE SAMPLING	☐	GW LEVEL MEASUREMENT	☐
SURFACE WATER SAMPLING	☐	AIR FLOW TABLES	☐
		PITS AND TRENCHING	☐

TOTAL NUMBER OF FORMS _____

FIELD DATA VALIDATION AND VERIFICATION BY _____ DATE _____

COMPUTER ENTRY AND VERIFICATION

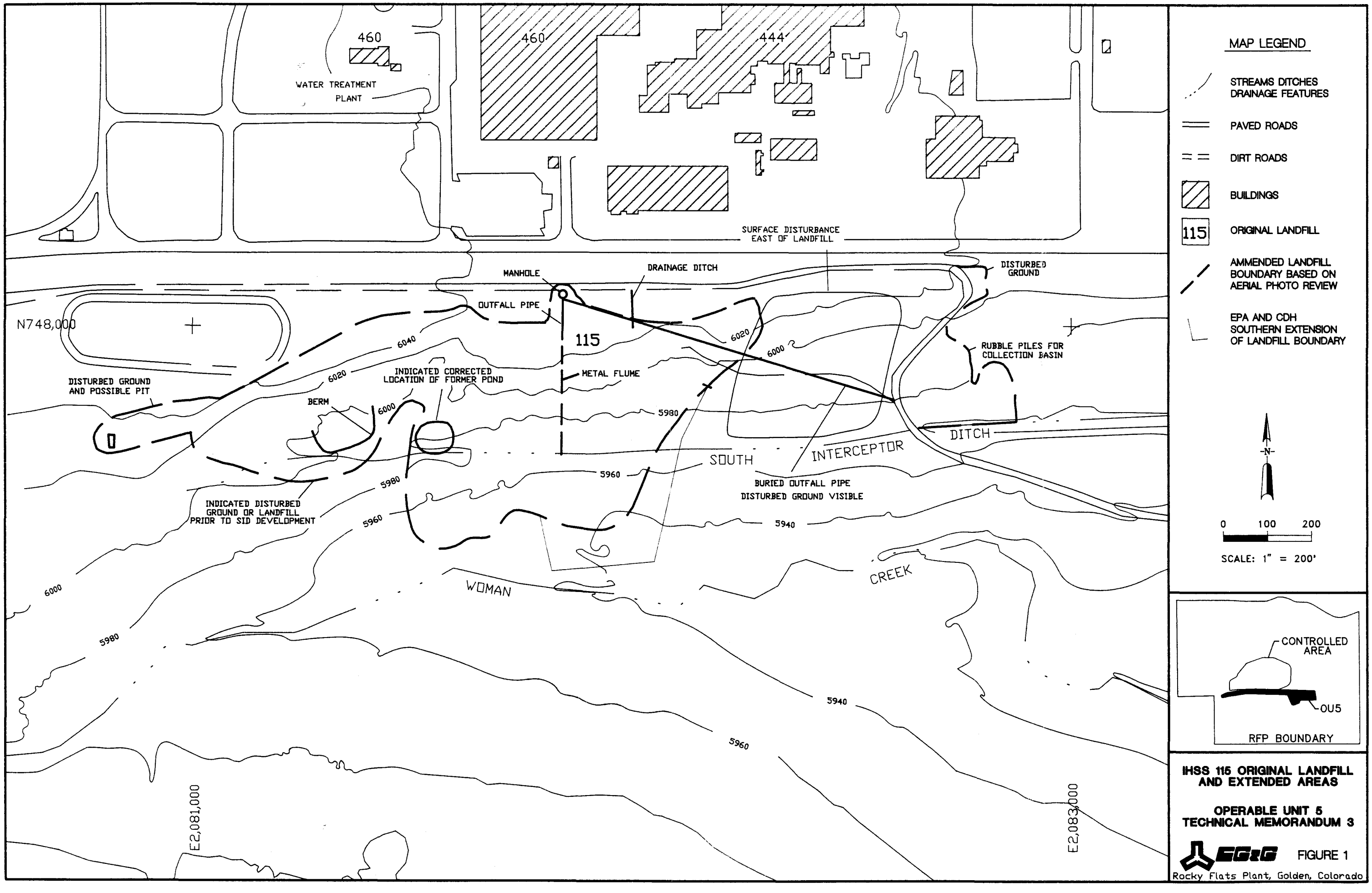
DATA ENTERED BY _____ DATE _____
VERIFICATION BY _____ DATE _____
CORRECTIONS BY _____ DATE _____
DISKETTE PREPARED BY _____ DATE _____

DATA AND DISKETTE DELIVERY TO EG&G

RECEIVED BY _____ DATE _____

FIELD DATA DELIVERABLE

SAMPLE NUMBER	LOCATION	DATE	SAMPLE NUMBER	LOCATION	DATE

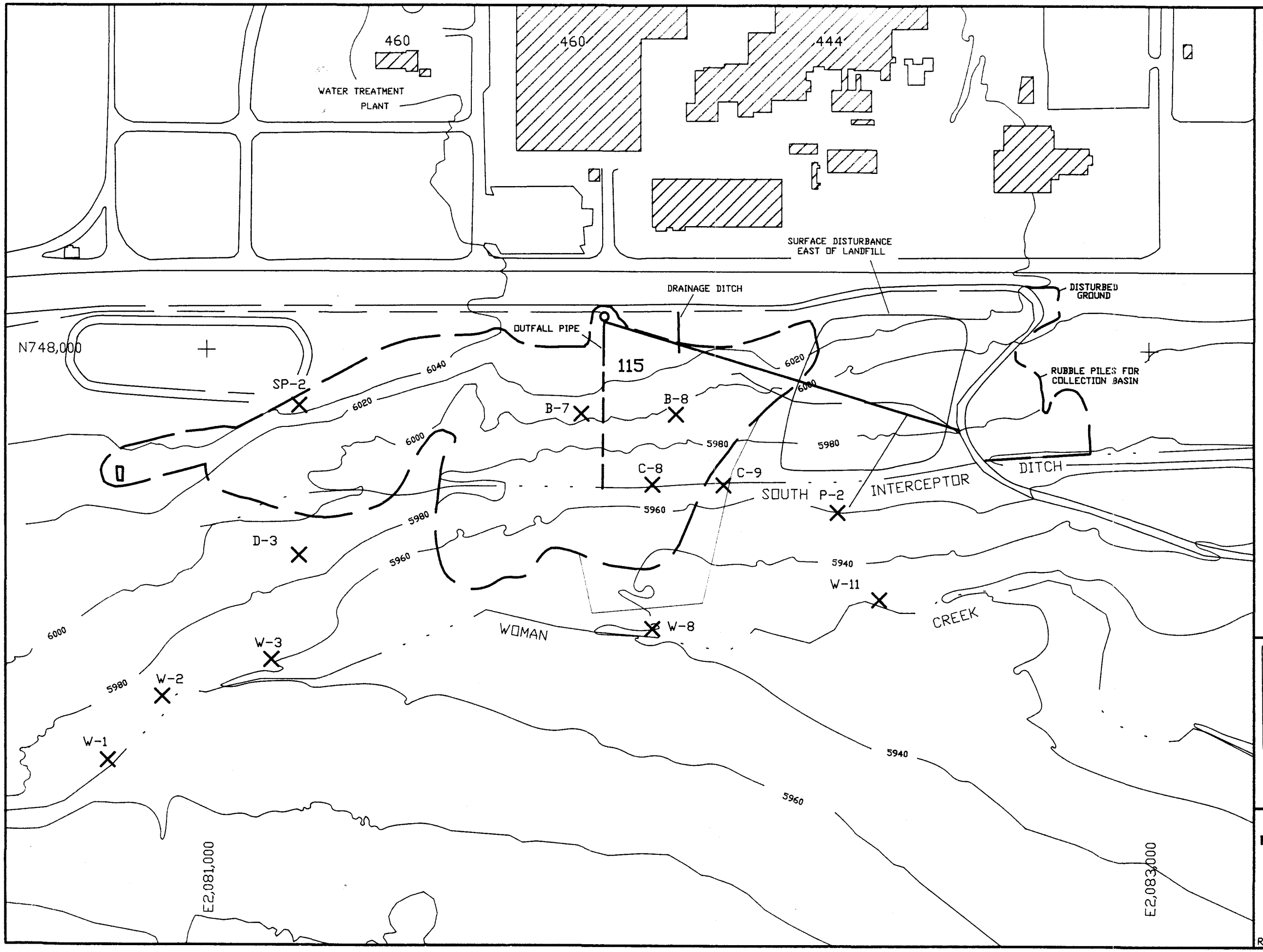


IHSS 115 ORIGINAL LANDFILL AND EXTENDED AREAS

OPERABLE UNIT 5 TECHNICAL MEMORANDUM 3

EG&G FIGURE 1

Rocky Flats Plant, Golden, Colorado

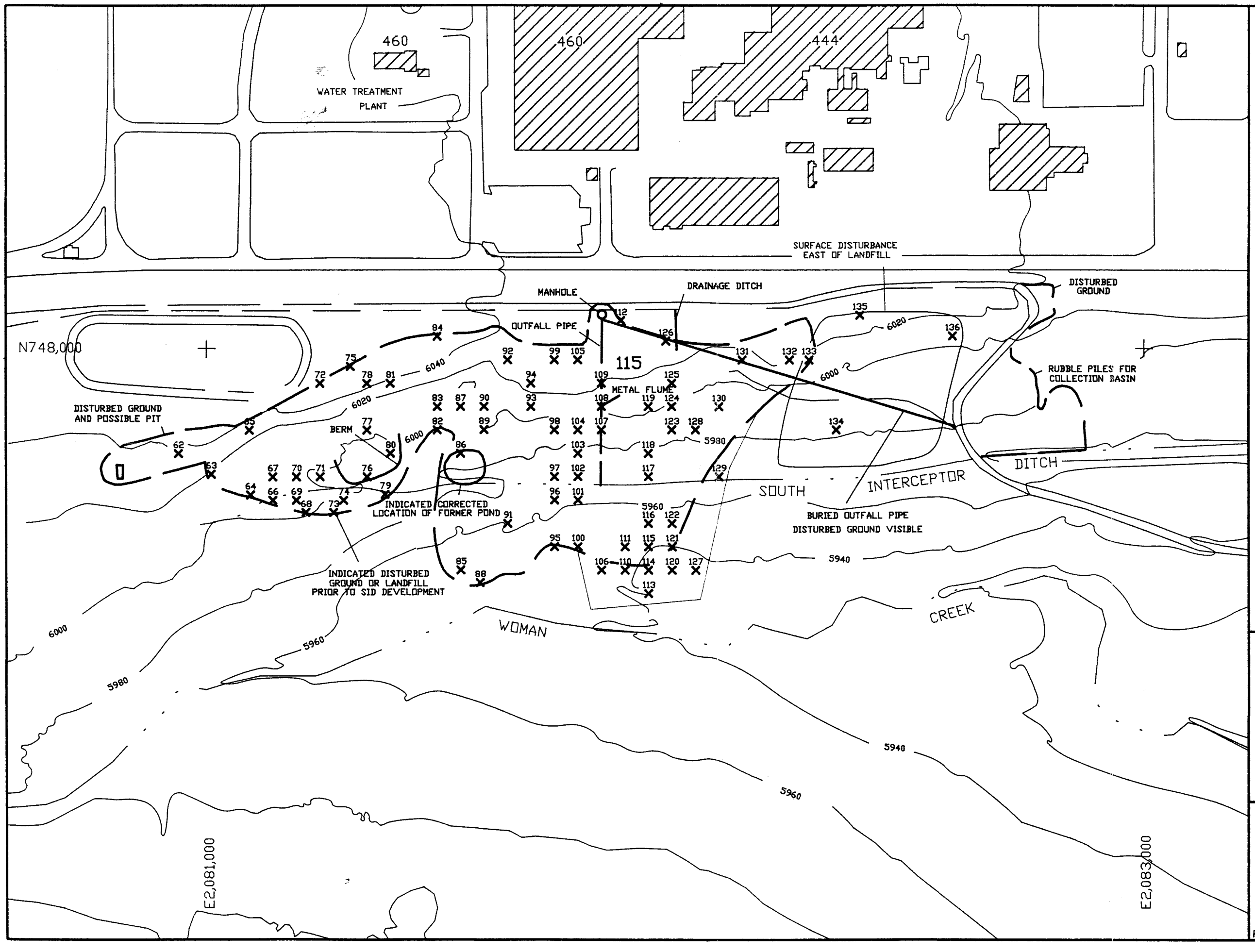


IHSS 115 ORIGINAL LANDFILL RADIATION SURVEY HOT SPOTS

OPERABLE UNIT 5 TECHNICAL MEMORANDUM 3

EG&G FIGURE 2

Rocky Flats Plant, Golden, Colorado



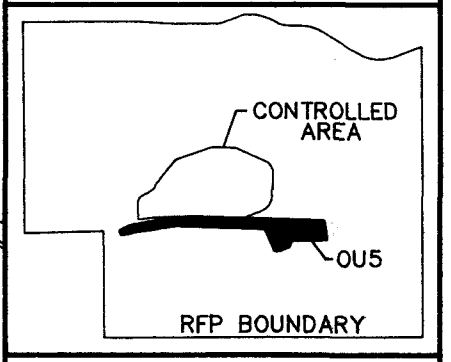
MAP LEGEND

- STREAMS DITCHES DRAINAGE FEATURES
- PAVED ROADS
- DIRT ROADS
- BUILDINGS
- 115 ORIGINAL LANDFILL
- AMMENDED LANDFILL BOUNDARY BASED ON AERIAL PHOTO REVIEW
- EPA AND CDH SOUTHERN EXTENSION OF LANDFILL BOUNDARY
- 102 PROPOSED RANDOM SAMPLE LOCATIONS

N

0 100 200

SCALE: 1" = 200'



IHSS 115 ORIGINAL LANDFILL AND DISTURBED AREA RANDOM SAMPLE LOCATIONS

OPERABLE UNIT 5 TECHNICAL MEMORANDUM 3

EG&G FIGURE 3

Rocky Flats Plant, Golden, Colorado